Rescuing La Scala's Music Archives

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The Teatro La Scala is probably one the best-known musical temples of the world. Built about 200 years ago in a central location of Milan, in Northern Italy, La Scala is particularly famous for opera performances. Destroyed during World War II, it blossomed again, thanks to the efforts of the great conductor Arturo Toscanini.

Although La Scala is often associated with operas, concerts, and recitals, it also possesses a historical audio archive of great significance: La Scala has recorded live performances since 1951, without interruption. Over the course of nearly five decades, La Scala has produced more than 5,000 tapes (analog open reels from 1951 to 1990 and digital audio tapes since 1991). Every tape contains the work of the most famous musicians of this century: singers, conductors, and performers alike.

La Scala has recorded every live performance since 1951. Unfortunately, most of the tapes are deteriorating rapidly.

RAPID DETERIORATION

Unfortunately, most of the tapes have not been well preserved and are deteriorating at a rapid pace. For this reason, in 1997 a panel of international sponsors funded a project for the preservation of this precious music heritage.

The panel includes the Milano per La Scala Foundation, which acts as coordinator of the project, under the responsibility of Secretary General Fiorenzo Galli; the Azienda Energetica Milano, the power utility of the City of Milan; Andersen Consulting; Hewlett-Packard; the Italian Commercial Bank; the Italian National Research Council; Oracle; TDK; and the Teatro La Scala Foundation USA.

The scientific direction and the execution of the project has been entrusted to the LIM, the Laboratorio di Informatica Musicale of the Computer Science Department at the University of Milan.

PRESERVATION PROCESS

The preservation process has four major steps:

1. The tapes must be cleaned, and some must be treated to remove moisture.
2. The content on the analog tapes is preserved exactly as it is found.
3. At least one CD-R master is made for each recording.
4. The attributes of both the original and new recordings are entered into a distributed, multiplatform Oracle database.

Cleaning and treating tapes

Many tapes must be cleaned by hand, turn by turn, with a special liquid. On some tapes, the oxide coating has softened and they have absorbed moisture over the years. These fragile tapes must first be specially treated if they are to be restored to playable condition—so they don't squeak or stick to the player's guides and heads, for example. The heat treatment consists of putting the tapes into an oven or incubator at a temperature of 45° to 55° C for at least three days.

Digitizing contents

Once the tapes are of a satisfactory quality for transferring, the contents are digitized at the standard sampling rate of 44.1 kHz with a 20-bit analog-to-digital converter. The digitized sound is stored on hard disks. The resulting digital audio files are edited and structured as digital tracks that correspond to single musical pieces. Meaningless *heads* and *tails* (the beginnings and endings of audio files that contain no meaningful information) are removed. The main goal of this step is to keep the original information exactly as it is found. Choices about editing for restoration are postponed. Hence, even extra noises are carefully preserved.

CD-R copies

The digital tracks are copied on two CD-Rs, one for La Scala's music archive and one as a backup, stored in a vault at the Italian Commercial Bank.

Database entry

While the content is being preserved, other information is being collected about the contents of the tapes, both from an artistic and a technical point of view. In addition, all the information acquired during cleaning, digitization, mastering—roughly 40 attributes about the original and new recordings—is entered into an Oracle 8 database. The database is multiplatform (Unix, Microsoft NT and Windows95, Mac OS) and distributed (10 workstations).

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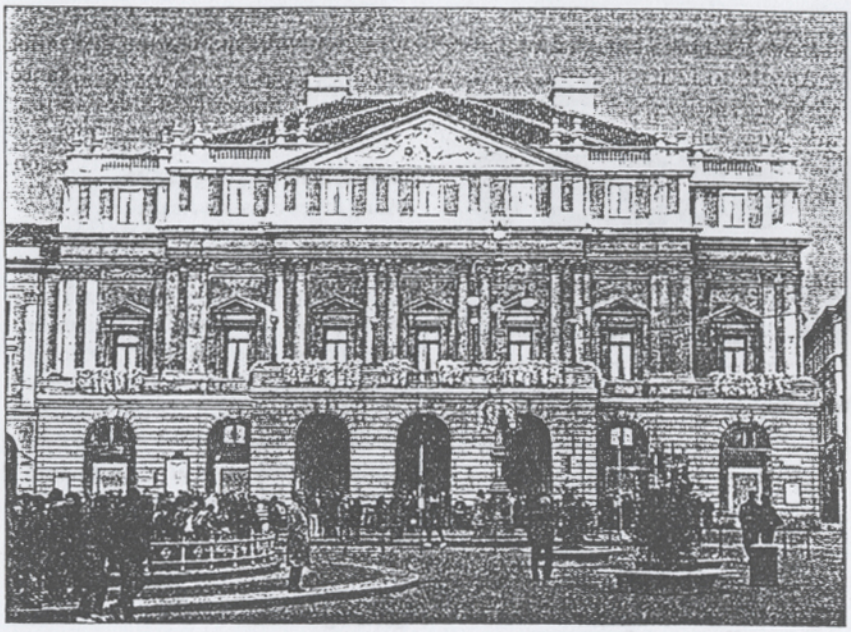

An initiative is under way to save the recordings made at Teatro La Scala since 1951.

The research team at LIM is designing and developing special software modules that will process musical and multimedia objects, including digital sound, scores and performances, photos, and videos. In this way, musicians who are currently preparing a performance that has been previously given at La Scala can easily access all CD-Rs of previous performances using a Sony CDL-2200 CD-ROM jukebox.

In the future, we plan to integrate additional musical media and information in the database.

Quick realization of this system has been made possible by the experience gained in producing the CD-ROM, *Standards in Computer-Generated Music* (IEEE CS Press, 1997), which was an effort undertaken by the IEEE CS Technical Committee on Computer-Generated Music.

In the fall of this year, the University of Milan will host a brand-new international conference, Computer Technology Applications in Music Archives—Toward Highly Interactive Music Databases. The conference will be a joint effort of the IEEE Computer Society's Technical Committee on Computer-Generated Music and the Italian National Research Council. The conference will be organized by LIM and the Milano per La Scala Foundation. The proceedings will be published in both printed and electronic form by the Computer Society Press. For more information, see http://lim.sm.dsi.unimi.it/CTAMA.

This project is an example of the activities undertaken by the CS Technical Committees and Technical Activities Board. It is also an excellent example of how state-of-the-art technology can be put to the service of preserving our cultural heritage, in the form of musical data in various shapes and formats.

No doubt many other theaters, libraries, and broadcasters have similar problems. Therefore we hope that this effort, supported by a strong base of scientific material to be published by the IEEE CS, will establish a body of knowledge to be used in future projects. ❖

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Call and Calendar

SUBMISSION INSTRUCTIONS

In the Call for Papers and Calendar sections, a symbol (❖) identifies the conferences, symposia, and workshops that the Computer Society is sponsoring or cooperating in. More information on these events can be obtained at s.wagner@computer.org.

Other multiple-topic events of interest to our readers are also listed. We publish notices in chronological order as space permits. For Calls for Papers, we publish notices according to deadlines for paper submissions. For Calendar, we publish notices according to the beginning and ending dates of events. Notices are not published on a first-come basis, and we do not guarantee publication in a given issue. There is no charge for notices published in the two sections. Because of the volume of submissions we receive, we cannot acknowledge submissions.

For inclusion in the Call for Papers section, please submit the event name, date(s), location, sponsor(s), deadline for submissions, the name of the person to whom papers should be submitted, that person's voice and fax numbers and e-mail address, and the event's Web page.

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For a submission to begin appearing in a given issue, it must arrive at *Computer* at least six weeks before the month of publication (that is, to appear in the May 1998 issue, a submission must arrive by March 15, 1998). Send submissions to Calendar, *Computer*, PO Box 3014, Los Alamitos, CA 90720-1314, fax (714) 821-4010, calendar@computer.org.

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